The Yellowstone River Instream Reservation

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INTRODUCTION

The Order of the Board of Natural Resources and Conservation establishing water reservations for the Yellowstone basin was signed on December 15, 1978. As a result of that Order, the Department of Fish, Wildlife and Parks was granted an instream reservation for the Yellowstone at Sidney of approximately 5.5 million acre-feet of water with varying amounts granted in upstream areas and tributaries.

The Department applied for instream reservations on many streams and tributaries where little, if any, flow data were available. In granting an instream reservation for those waters, the Board frequently granted a percentile flow rather than a specific amount of water in acre-feet or cfs. In such areas the Department was directed by the Board through condition 116 to develop and submit to the Board within 5 years of December 15, 1978, a plan to convert the minimum flow instream reservation quantities into cubic feet of water per second and acre-feet of water per month.

Condition 117 states that the reservant shall submit to the Board an annual progress report setting forth accomplishment toward completion of such work as outlined in condition 116, a schedule of anticipated progress and other information as may be required. This report is designed to fulfill the requirement of the first-year annual progress report and outlines a tentative plan for accomplishing the objectives outlined in condition 116 for the Board's consideration.

In addition, this report will comment on events pertaining to the reservations which occurred in the past year. Biological studies pertaining to the Yellowstone basin are listed and ongoing Department investigations in the basin are summarized. Problems peculiar to the Tongue River are also discussed. Additional information from the Department may be obtained upon request.

PROPOSED METHODOLOGY FOR DEFINING PERCENTILE FLOWS

The following section contains a plan to convert the minimum-flow instream reservation on the Yellowstone River and its tributaries into cubic feet of water per second and acre-feet of water per month using hydrologic modeling techniques. This plan is intended as a first step toward meeting the requirements set forth in condition 116 of the Order of the Board of Natural Resources establishing water reservations and is offered for further consideration. The proposed plan was prepared for the Department of Fish, Wildlife and Parks by Systems Technology, Inc. of Helena.

I. Background

As a result of the Board of Natural Resources and Conservation (BNR&C) Order for establishing water reservations on the Yellowstone River, specifically condition 116B, the Montana Department of Fish, Wildlife and Parks (MFWP) is instructed to submit to BNR&C within five years of the effective date of the adoption of the minimum-flow instream reservation, a plan to convert the minimum-flow instream reservation quantities into cubic feet of water per second and acre-feet of water per month for those streams with less than 10 consecutive years of acceptable stream flow records. This plan may include the following:

> A listing of streams or portions of streams where the alternative conversion method (hydrologic modeling techniques) will be used in converting minimum-flow instream reservation quantities into cubic feet of water per second and acre-feet of water per month. Upon approval of the Board, hydrologic modeling techniques may be used for ungaged streams or sites, or for streams with less than 10 consecutive years of record. The plan shall specify modeling techniques, the reach of stream to which modeling will be applied, schedules, cost estimates, agency undertaking the modeling, and the agencies which will benefit from the modeling results. All modeling results shall be adjusted to the 1978 level of development.

The purpose of this report is to identify those streams for which simulated flow data could be used to determine the minimum instream flow values, and describe the various approaches for simulating flow data. Table 1 lists those streams that have been identified.

Table 1. Summary of Streams in Need of Analysis.

Major Drainage Basin	Stream Designation
Tongue River	Hanging Woman Creek
	Otter Creek
	Pumpkin Creek
Middle Yellowstone River Mainstem	Rosebud Creek
Clarks Fork River	Clarks Fork River
	Butcher Creek
	Willow Creek
	Red Lodge Creek
	Clear Creek
	Dry Creek
	Rock Creek
	Sage Creek
	Bluewater Creek
Stillwater River	Castle Creek
	Picket Pin Creek
	W.F. Stillwater R.
	Little Rocky Creek
	W. Fishtail Creek
	E. Fishtail Creek
	Fishtail Creek
	E. Rosebud Creek
	W. Rosebud Creek
Upper Yellowstone River Mainstem (Stillwater to Shields)	Bridger Creek
	Lower Deer Creek
	Upper Deer Creek
	Sweet Grass Creek
	Mission Creek
	Little Mission Cr.
Shields River	Smith Creek
	Flathead Creek
	Rock Creek
	Brackett Creek
	Shields R. @ mouth

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Table 1. (continued)

Major Drainage Basin	Stream Designation
Upper Yellowstone River Mainstem (above Shields)	Bear Creek
	Cinnabar Creek
	Mol Heron Creek
	Cedar Creek
	Tom Miner Creek
	Rock Creek
	Big Creek
	Six Mile Creek
	Pridley Creek
	Eight Mile Creek
	Mill Creek
	Trail Creek
	Suce Creek
	Coke Creek
	Billman Creek
	Fleshman Creek
	Armstrong Spring Cr.
	Nelson Spring Creek
	McDonald Spring Creek
	Emigrant Spring Creek

II. Technical Discussion

A. Methodology. The major task set forth by condition 116B is the determination of flow values corresponding to the various percentile flow levels granted on streams for which no flow duration hydrographs exist. The methodology proposed involves three steps:

1. Determination of estimated natural flows (i.e., the flow at no development);

2. Determination of 1978 level of development flows (i.e., the flow that would have occurred if development had been at the 1978 level for the entire period being synthesized);

3. Determination of the flow duration hydrograph and selection of appropriate flow value.

In order to determine estimates of natural flow, a number of assumptions on water usage are needed. The following lists

some of the assumptions used by DNR&C and USGS for similar analysis on other streams in Montana.

1. Diversion of water for small irrigation projects is assumed to affect natural flow downstream in the month of use.

2. The consumptive uses of small storage and stockwatering projects are assumed to accumulate as storage depletion after spring runoff. These consumptive uses would affect natural flow in the first month of runoff in the following year.

3. Diversions from flow are assumed to influence all downstream points in the same time period (month).

4. Consumptive uses are estimated using the following assumptions.

    a. Stockwatering uses would average 1 acre-foot per year for every 50 head of livestock.
    b. Spring backflood uses would average 10 inches over the flooded area.
    c. Gravity or pump diversion uses will be estimated from present cropping, soils, and water availability. The gross irrigation depletion per irrigation is 7.7 inches.

5. Annual evaporation losses from small storage projects are assumed to be the product of net evaporation in feet times 60 percent of the area at full supply level. This assumption is based on average operating levels determined by previous studies of similar small projects.

6. Net monthly evaporation will be assumed to be the difference between gross monthly evaporation and monthly precipitation. An incomplete record of precipitation generally exists for specific streams. This record will be completed with precipitation recorded from nearby stations and transferred to the stream basin using ratios of mean annual precipitation. Evaporation losses at small projects are estimated using the total annual net evaporation.

In addition to these assumptions on water usage, a number of techniques will be used to synthesize missing flow data:

1. Simple and multiple regressions using a stepwise regression procedure. The best regression equation will be selected on the basis of the equation having the minimum standard error of estimate. However, some regression equations may be rejected if the intercept is too high, biasing the low-flow estimates. The independent variables for the regressional analysis will be stream basin characteristics such as drainage area, precipitation, main channel slope, mean basin elevation and forest cover (Boner and Buswell, 1970).

2. The SCS Method (Schwab et al, 1966) of determining direct runoff from precipitation and various soil characteristics.

3. Correlate the available flow data on the stream in question to the drainage area for a gaged stream all of which are in the same watershed.

The technique used for a given stream will depend upon the available information (stream flow and water usage), and which gives the best estimates.

Once the estimated natural flows for a sufficient period have been determined they will be adjusted for the 1978 level of development. This procedure will require knowledge and/or estimates of water usage for 1978. The needed information is generally available from DNR&C. The adjustment procedure contemplated would employ the WAPRS' Hyd II water balance model. This model balances the quantity of water at a stream station given the inflow to the station and water usage at, above, and below the station.

The flow duration hydrograph will be determined using the Log-Pearson Type III analysis applied to the 1978 level of development flows. This will yield the appropriate flow value for the percentile flow granted by BNR&C.

Table 1 identified 53 streams for which an analysis will be needed to determine an appropriate flow value. These streams can be grouped (Table 2) according to the amount of flow data available:

1. Streams with 10 or more years of flow records;
2. Streams with flow record, but less than 10 years;
3. Streams with now flow record;

Table 2. Stream Grouping According to Available Flow Data.

Streams With 10 or More Yrs. of Record	Streams With Less Than 10 Yrs. of Record	Streams With No Stream Flow Record
Willow Creek (no winter record)	Hanging Woman Creek	Clear Creek
Red Lodge Creek	Otter Creek	Dry Creek
Rock Cr. (Clarks Fk.)	Pumpkin Creek	Castle Creek
Bluewater Creek	Rosebud Creek (Middle Yellowstone)	Little Rocky Cr.
W. Rosebud Creek	Butcher Creek	W. Fishtail Cr.
Sweet Grass Creek	W.F. Stillwater Creek	E. Fishtail Cr.
Brackett Creek	Mainstem Fishtail	Bridger Creek
Clarks Fork	E. Rosebud Creek	Lower Deer Cr.
	Cottonwood Creek	Upper Deer Cr.
	Rock Creek (Shields)	Mission Creek
	Tom Miner Creek	L. Mission Cr.
	Rock Creek (Upper Yellowstone)	Smith Creek
	Big Creek	Flathead Creek
	Fridley Creek	Cedar Creek
	Mill Creek	Six Mile Creek
	Billman Creek	Eight Mile Cr.
	Sage Creek	Suce Creek
	Mol Heron Creek	Coke Creek
	Bear Creek	Armstrong Spring Creek
	Shields River at mouth	Nelson Spring Creek
		McDonald Spring Creek
		Emigrant Spring Creek
		Picket Pin Cr.
		Cinnabar Creek
		Trail Creek
		Fleshman Creek

As Table 2 shows only about 10% of the streams have 10 or more years of flow record, with about 50% having no stream flow record. Streams in the third group, those with no flow record, will require the synthesis of an entire data base. For verification purposes, at least 1 year of daily and/or monthly stream flow data should be collected. Some stream flow data collection may also be needed for streams in the second group where the analysis indicates a problem with the validity of the available data. Data collection can occur concurrently with the analysis

procedures. The analysis for those streams in group one can proceed generally without the need for simulating flows, although the historical flows will have to be converted to estimated natural flowsand then the 1978 level of development flows.

B. Work Plan.

Task 1: Assemble and Evaluate Available Information and Data.

This task will involve the gathering of all information and data available on the various streams. The information will include drainage characteristics such as climate, area and topography, and water usage such as municipal and agricultural demands. This information will then be evaluated to determine its sufficiency and adequacy. The evaluation will identify those streams where collection of stream flow data is necessary and the appropriate technique to use in determining the flow duration hydrograph.

Task 2: Development of Flow Duration Hydrographs.

This task will involve the actual implementation of the appropriate technique for determining the flow duration hydrograph and the resultant flow value corresponding to the granted percentile flow level. Further, gaging sites can be set up and put into operation for those streams identified in Task 1 where collection of stream flow data is necessary. For most of these streams, a staff gage and/or float recorder will suffice. The calibration can proceed concurrently with the recording of depths. For some streams, the USGS should be requested to put in a continuous recording flow gaging station.

Task 3: Report.

The final report will include the following sections.

A. Introduction - stipulating the purpose of the investigation;

B. Information Sources - summarize the available data as to their extent and the source;

C. Methodology - discussion of the assumptions and techniques employed with the various streams;

D. Results - a listing of the various flow values along with a discussion of their reliability.

III. Benefits and Costs

A. Benefits. A number of other agencies will benefit from this analysis including the Water Quality Bureau (WQB), Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), Department of Natural Resources and Conservation (DNR&C), Department of State Lands (DSL), U.S. Forest Service (USFS), and Bureau of Land Management (BLM). These agencies have an interest in instream flow and would benefit in a number of ways from a knowledge of estimates of the actual flow values reserved for instream. For example, with these estimates the WQB could determine the amount of assimilative and dilution capacity available in the various streams. The DNR&C could estimate unappropriated waters. This analysis could also provide refinement of the various techniques involved, which are used by the USGS.

B. Costs. The estimated cost of analyzing all 53 streams is about $120,000. This includes personnel, computer expenses, travel expenses, and equipment installation, operation and maintenance. A breakdown of this cost is provided in Table 3. Most of the 25 sites should be equipped with float recorders. It is anticipated, however, that at some of the sites a local resident could take daily staff gage readings and thus eliminate the need for a float recorder. The estimated three sites where USGS continuous flow recording stations would be installed are sites where flows are generally too large to gage manually or accurately with only staff gages or float recorders.

Table 3. Cost Estimate.

Personnel		
Water Resource Engineer, 1 man year @ $150/day		39,000
Water Resource Technician, 1 man year @ $75/day		19,500
Secretary	3 months	3,000
Computer Expense	400 hours	7,500
Includes both private (@ $18) and State (@ $120)		
Travel Expense		
Mileage	20 trips @ 1,000 miles/trip	4,000
Lodging/Meals		3,400
Equipment		
Staff Gages and/or Float Recorders		
Approximately 25 sites @ $500/site		12,500
USGS Continuous Flow Gaging Station		
Approximately 3 sites @ $9,260/site		27,780
Flow Measuring Device		1,500
Contingencies		2,500
	Total Estimate	120,680

EXISTING FLOW DATA

Instream flow reservations generally consisting of a fixed percentile of the monthly flows of record were granted in the Order establishing water reservations in the Yellowstone basin. The magnitude of these percentile flows in terms of cubic feet of water per second and acre-feet of water per month was not defined for all or portions of 53 tributaries having a granted instream reservation. Under condition 116 of the Order, it is the responsibility of the Departments of Fish, Wildlife and Parks and Natural Resources and Conservation to determine these percentile flows.

The flow data available for these 53 tributaries are summarized in Table 4. Daily USGS records are presently available for 18 of the tributaries with 8 tributaries having at least 10 years of consecutive daily records, the minimum needed to define the granted percentile flows. If the USGS continues the operation of existing gages, at least 10 years of continuous daily records will be available for an additional 5 tributaries by 1984.

Miscellaneous flow measurements collected by the USGS and the DFWP are also available for some of the 53 tributaries (Table 4). These data are on file with the USGS in Helena and at the DFWP regional offices at Bozeman, Billings, and Miles City. Much of the flow data collected by the Department for the upper Yellowstone River tributaries (above Livingston) and Shields River tributaries is published in Berg (1975).

The USGS gages in operation in 1979 and pertinent to the instream flow reservation in the Yellowstone basin are shown in Figure 1. Four of the gages are located on the mainstem Yellowstone and the remaining 19 on tributaries.

Under a cooperative agreement with the USGS, the Department of Fish, Wildlife and Parks established a gage near the mouth of the Shields River (near Livingston) in 1978. This gage site will provide flow data needed to comply in part with condition 116 of the Order. Additional gage sites will be established on other Yellowstone tributaries where deemed necessary.

Table 4. Summary of available flow data pertinent to the instream flow reservation in the Yellowstone basin.

	USGS GAGE SITE	USGS DAILY RECORDS	USGS MISC. RECORDS	OTHER MISC. RECORDS AVAIL.
Tongue River Tributaries				
Hanging Woman Cr.	Near Birney	1973-79		
Otter Cr.	At Ashland	1972-79		
Pumpkin Cr.	Nr. Miles City	1972-79		
Rosebud Cr.	Near Colstrip	1974-79		
Rosebud Cr.	At Mouth	1974-79		
Clarks Fork River & Tributaries				
Clarks Fork R.	Near Belfry	1921-79		
Clarks Fork R.	Near Silesia	1969-79		
Butcher Cr.	Nr. Absarokee	1960-62		X
Willow Cr.	Near Boyd	1937-79(P)		X
Red Lodge Cr.	Ab. Cooney Res.	1937-79(P)		X
Clear Cr.	-			X
Dry Cr.	-			X
Rock Cr.	Nr. Red Lodge	1931;1934-79		X
Sage Cr.	-			X
Bluewater Cr.	At Fromberg	1961-64		X
Bluewater Cr.	Near Bridger	1960-70		
Stillwater R. Tributaries				
Castle Cr.	Near Nye		1972-73	
Picket Pin Cr.	-			
W. Fork of Stillwater R.	Below Castle Cr		1970-73	
W. Fork of Stillwater R.	At Nye		1970-72	
Little Rocky Cr.	Near Nye		1970	
W. Fishtail Cr.	-			
E. Fishtail Cr.	-			
Fishtail Cr.	At Fishtail		1972	X
W. Rosebud Cr.	Near Roscoe	1965-79		X
E. Rosebud Cr.	At Roscoe	1921-24		X
E. Rosebud Cr.	Near Roscoe	1920-21		
Middle Yellowstone R. Trib's.				
Bridger Cr.	Near Greycliff		1960-74	X
Lower Deer Cr.	-			X
Upper Deer Cr.	-			X
Sweetgrass Cr.	Nr. Melville	1907-12		X
Sweetgrass Cr.	Above Melville	1912-24; 1937-69		
Sweetgrass Cr.	Below Melville	1907-24; 1937-42; 1946-52		
Sweetgrass Cr.	Nr. Greycliff	1941-42		
Mission Cr.	-			X
Little Mission Cr.	-			

Table 4 continued. Summary of available flow data pertinent to the instream flow reservation in the Yellowstone basin.

	USGS GAGE SITE	USGS DAILY RECORDS	USGS MISC. RECORDS	OTHER MISC. RECORDS AVAIL.
Shields R. & Tributaries				
Shields R.	Nr Livingston	1978-79		
Smith Cr.	-			X
Flathead Cr.	-			X
Cottonwood Cr.	At Clyde Park		1974	X
Rock Cr.	Nr. Clyde Park		1979	X
Brackett Cr.	Nr. Clyde Park	1921-23; 1934-57		X
Upper Yellowstone R. Trib's.				
Bear Cr.	At Jardine	1946-49		X
Cinnabar Cr.	-			
Mol Heron Cr.	-			X
Cedar Cr.	-			
Tom Miner Cr.	-			X
Rock Cr.	-			X
Big Cr.	Nr. Emigrant	1973-79		X
Six Mile Cr.	Near Chico		1976-77	
Fridley Cr.	-			X
Eight Mile Cr.	Near Chicory		1976-77	X
Mill Cr.	Near Pray	1951-56		X
Mill Cr.	Near Mouth		1976-77	
Mill Cr.	Above Diversions		1976-77	
Trail Cr.	-			
Suce Cr.	-			
Coke Cr.	-			
Billman Cr.	-			X
Fleshman Cr.	-			
Armstrong Spring Cr.	-			X
Nelson Spring Cr.	-			
McDonald Spring Cr.	-			X
Emigrant Spring Cr.	-			X

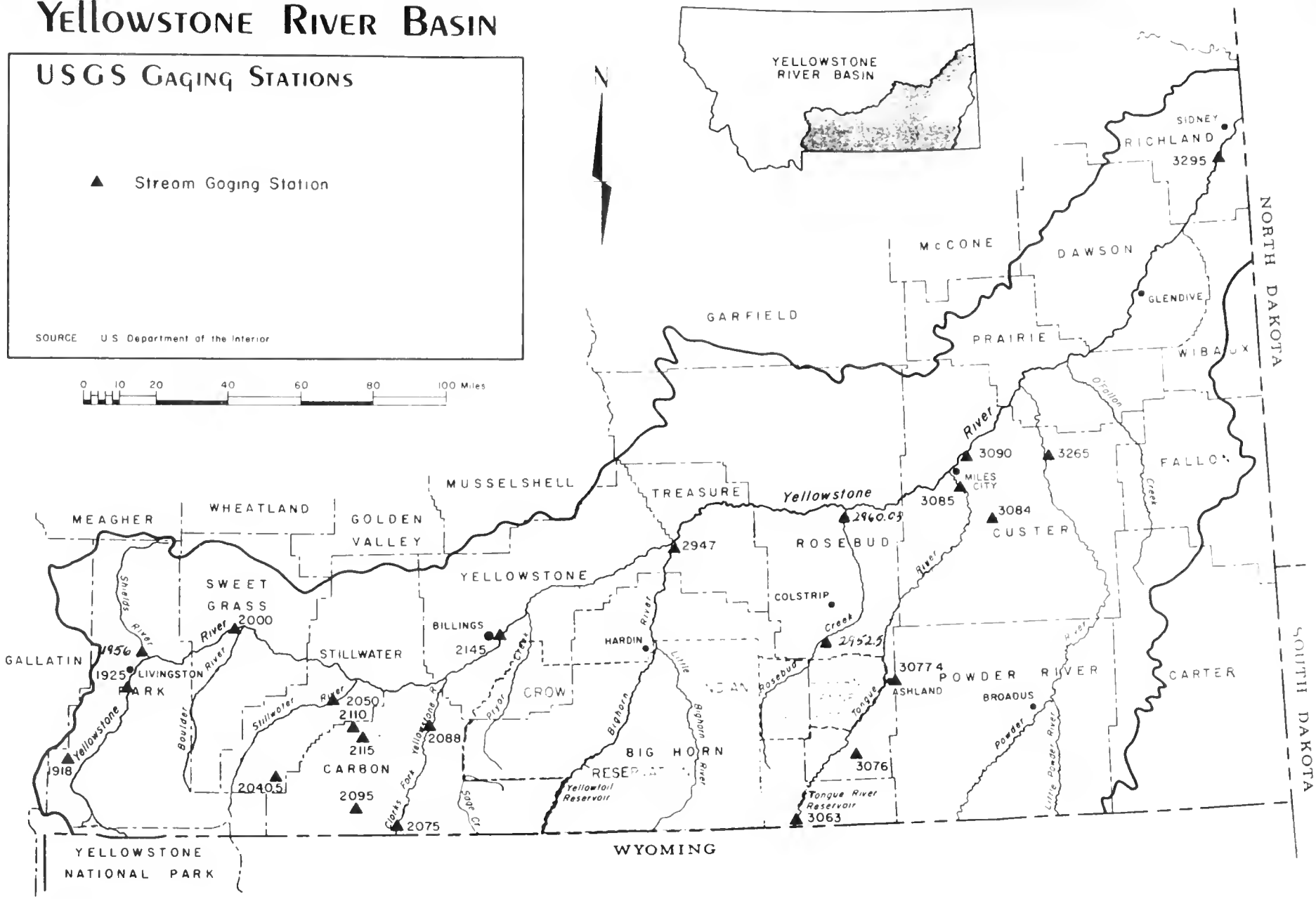

FIGURE 1. Gaging stations (USGS) operational in the Yellowstone Basin in 1979.

SUMMARY OF LEGAL PROCEEDINGS RELATED TO YELLOWSTONE RIVER WATER RESERVATION

In this report period, several legal proceedings have been instituted that relate to the Board of Natural Resources and Conservation's (BNRC) Order establishing water reservations in the Yellowstone basin. This section summarizes those proceedings to date.

Montana state law provides that an administrative order may be reheard by the acting administrative agency. Subsequent to the Order of the Board on December 15, 1978, the City of Billings, Utah International, Inc., and the 14 conservation districts asked for a rehearing by the Board on their several and separate issues. These requests for rehearing were denied by the Board in May of 1979.

The City of Billings and Utah International, Inc. instituted separate court actions, seeking review of the administrative order of the BNRC in the matter of the Yellowstone River water reservations. The City of Billings filed its petition on March 5, 1979. Therein it sought judicial review of the Order as related to the applications of the City of Billings, the Department of Fish and Game, and the Department of Health and Environmental Sciences.

The relief requested by the City of Billings is to change the amount of water reserved to that city and to place all municipal reservations granted in the proceeding on an equal pro rata, first-priority basis for use of the Yellowstone River basin water; alternatively Billings seeks the court to remand the question of reservation of water by the City of Billings from the Yellowstone River to the Board of Natural Resources & Conservation with instructions to the Board to amend that Order and the supporting Findings of Fact and Conclusions of Law so that they would conform to federal and Montana law, rules, and regulations; and finally, for costs of suit on appeal and reasonable attorneys' fees.

Subsequent thereto, the Montana Department of Fish and Game moved to dismiss the City of Billings' petition and further answered and responded to the petition. The dismissal was sought on the grounds that the petition failed to state a claim or petition upon which relief could be granted; that the petition failed to comply with applicable statutory provisions; and that the court had no jurisdiction to review administrative proceedings of the Board of Natural Resources & Conservation.

In answering Billings' petition the Department admitted that the City of Billings had exhausted all administrative remedies and denied each and every other allegation set forth in the petition. Further, the Department responded that the petitioner's allegations were based on an exiguous perusal of the Board's order, in that the Board did not grant separate instream reservations to the Department of Fish and Game and the Department of Health & Environmental Sciences but rather granted overlapping and coexisting reservations.

The time for appearance by respondents was extended. In May of 1979, Intake Water Company made its initial appearance in the City of Billings' suit for the purpose of ensuring that Intake's rights and interests were protected.

Throughout this process, the Departments of Fish and Game and Health & Environmental Sciences have attempted to work a settlement of the concerns of the City of Billings and have met with the city on one occasion and have caused several letters to be written and phone calls to be made between the attorneys of the parties for the purpose of reaching a mutually agreeable settlement. To date this settlement has not been finally effectuated. However, it appears that agreement is close.

Utah International, Inc. filed a petition for review of the Order of the Board establishing water reservations on April 9, 1979. In this petition, Utah asked the court to review the Order of the Board as it related to water from the Powder River and Powder River tributaries. The reservants challenged in this petition were Department of State Lands, North Custer Conservation District, Powder River Conservation District, Department of Fish and Game, and the Department of Health & Environmental Sciences.

By its petition Utah International seeks to have a declaration by the court that its application for beneficial use of Powder River water is allocated a priority date of November 20, 1973, thereby making it senior to the water reservations of the Powder River; and further, that the reservation orders that indicate the reservants have priority dates senior to Utah be declared void, illegal, and unenforceable; in the alternative, that the question of reservation of water on the Powder River be remanded to the Board of Natural Resources & Conservation with instructions to the Board to amend its orders to show that such orders as they relate to the Powder River would conform with federal and Montana law, rules, and regulations made pursuant thereto. Or further in the alternative,

that the matter be remanded to the Department of Natural Resources & Conservation with instructions to reinitiate the entire reservation process; and finally, for cost of suit on appeal and reasonable attorneys' fees.

Extension of time was also granted on this matter by the court. Intake Water Company then interposed itself into the Utah International suit. Both Utah and Intake briefed their arguments and submitted them to the court for consideration.

Pursuant to motion of Utah International, Inc. on June 29, 1979, hearing was had before the court on the question of the continuance of Intake Water Company in the Utah suit. The hearing was held before the court and all respondents to the Utah petition objected to Intake's appearance and continued presence in the suit for a variety of grounds including Intake was not a proper party; it had not perfected its appeal; and Intake had not contested the Orders of the Board. After all parties had opportunity to argue their position, it was made clear that Utah was not asking for relief against Intake Water Company in its petition for review of the Board's Order as that question was properly before two other district courts -- one federal and one state. The court then granted the motion of Utah International to strike and remove Intake Water Company from this proceeding.

Throughout this process, the parties had been attempting to work out some stipulation and settlement between them. In this regard, continued extensions of time have been requested and were granted.

It should be noted that the Department of Fish and Game's name was changed effective July 1, 1979. All references hereinafter will be to the Department of Fish, Wildlife & Parks. It should also be noticed that while the original application for the Department was made by the Montana Fish and Game Commission, by legislative action in 1977, the head of the Department of Fish and Game was changed from the commission to the director. Thereafter, references to the commission or Department should be interchangeable, and as previously mentioned, references after July 1, 1979 will be to the Department of Fish, Wildlife & Parks. The duties and responsibilities of that Department have continued to be the same throughout these changes in name and department head.

In August of this year, DFWP responded and answered. In its answer and response the Department sought to have the court receive written briefs, hear oral arguments upon issues, and finally confirm the Board of Natural Resources' decision.

During this process, the DHES moved for summary judgment in the matter as related to itself. Upon further discussion between all parties, particularly DHES and Utah International, a consent decree, judgment, and order was entered into by all parties. This consent decree in short stated that DHES had not requested water from the Powder River for its reservation nor did the Board of Natural Resources and Conservation grant water of the Powder River to DHES.

That issue being settled, Utah International agreed that DHES could withdraw itself from the suit.

DFWP has moved for separate hearing on the issues of this particular suit. The essence of this motion is to have a separate hearing on the issue raised by Utah in its petition that Utah has a priority date for its water right application earlier than any of the applications for reservation filed by the respondents in this suit. Further, the hearing would address the prayer for relief by Utah wherein that relief is to declare void, illegal, and unenforceable those portions of the Board of Natural Resources & Conservation orders that purport to allocate reservations with priority dates senior to Utah International's.

At the date of this report, the motion for separate hearing has not been decided by the court. There has been an extension of time requested by one of the respondents and the date for hearing will be most likely after the new year.

In conclusion, the rehearings before the Board have been denied and those issues are laid to rest. The petitions for review before the two district courts of this state are continuing. Settlement is close in the City of Billings case. The separation of issues in the Utah International case has yet to be decided. Until that decision, further comment on that case is mere supposition.

This section was prepared by F. Woodside Wright, legal counsel for the Department of Fish, Wildlife & Parks.

WATER AVAILABILITY - YELLOWSTONE RIVER AT BILLINGS

An apparent dilemma exists in the reservations granted for the Yellowstone at Billings with respect to availability of water allocated to the conservation districts. The problem is perceived as follows.

The Department of Fish, Wildlife & Parks was granted an instream flow reservation for August and September of 4,090 and 3,415 cfs, respectively. This corresponds roughly to the 65th percentile flow and means that water in excess of our reservation occurs approximately 65 years out of 100. Flows granted for May, June and July represent approximately the 85th percentile level. The instream reservations were given second priority in this reach.

The conservation districts at Billings and upstream were granted reservations totaling 207,764 af/yr and were given third priority. To economically develop efficient, full-service irrigation systems, a good water supply is usually considered to be necessary about 8 years out of 10, on the average (Draft EIS Vol. I 1976).

Since these conservation district reservations are junior to the instream reservation, they are subject to a certain water availability constraint. For the months of August and September, the constraint imposed by the 65th percentile instream flow level does not allow for the economic development of the water reserved for the conservation districts in this reach of river.

Since the conservation districts at and above Billings were granted a water reservation for future irrigation opportunities, it seemed advisable to explore the possibility of modifying the instream reservation at Billings to allow for the economic utilization of that water by the districts. The two entities holding instream reservations for this reach of river are the Department of Fish, Wildlife & Parks (DFWP) and the Department of Health & Environmental Sciences (DHES). During May 1979, the conservation districts, through their legal counsel, were informed of our intent in this matter.

During the interim, the DFWP and the DHES met frequently to consider the problem of increasing water availability for the mainstem Yellowstone at Billings while, at the same time, not jeopardizing the purpose or intent of the instream reservations. After considering such matters as probable potential for future irrigation, net depletion considering the return

flow and priority of reservations, the DFWP determined that the instream flow reservation could be reduced during the irrigation season (May 1 through September 30) to the levels indicated in Table 5. These levels should not cause serious degradation of the aquatic and recreational resources in that reach of the Yellowstone. The priority of the instream reservation would prevent future irrigation withdrawals from increasing the frequency or severity of low flow events. At the same time, water availability would be increased to the 91st to 82nd percentile level from July 11 through September 30.

In addition, the purpose of the high water period (May-July 10) is to provide flows sufficient to initiate bedload movement (Dominant Discharge) and sediment transport. The annual flushing action cleanses intergravel spaces assuring successful fish reproduction and adequate food production. With adequate high flows, the existing channel morphology is assured.

Table 5. Revised DFWP Proposed Instream Flow Reservation, Yellowstone River at Billings, Montana. (May 1 - September 30)

Month	Flow Cfs	Ac-ft		Approx. Percentile
May (1-20)	5,124	203,199		90.0
May (21-31)	12,204	266,214		
Jun (1-7)	17,242	239,337		87.8
Jun (8-30)	19,042	868,487		
Jul (1-10)	10,277	203,786	84.3%	91.1
Jul (11-31)	4,000	153,720	97.5%	
Aug	3,500	215,156		83.0
Sep	3,000	178,470		82.3

It is recognized that the only real possibility for altering the spring hydrograph and materially affecting channel configuration on the Yellowstone is a mainstem impoundment. Normal irrigation demands on the Yellowstone during the high flow months should not significantly affect the spring hydrograph. With this in mind, it is suggested that those lands which are developed for irrigation with waters granted to the conservation district and subject to water availability constraints from July 11 through September 30, would not be subject to water availability constraints from May 1 through July 10.

The principal irrigated crop in the Yellowstone basin upstream from Billings is hay, although some cash crop farming exists. The lack of water availability constraints during the high flow months should allow for the production of two hay crops during most years, even if water is somewhat restricted during August and September during drought years.

The above approach to increasing water availability in the Yellowstone from Billings upstream was offered to the DHES for their concurrence. After water quality responsibilities were considered in that reach of river, it was concluded that DHES could not agree to the September flow figures proposed by DFWP without violating existing water quality standards. DHES will not consider flows for September which were less than those originally granted (3,415 cfs). We are not able to resolve that difference. Therefore, at the present time the flows at Billings can be adjusted to the extent shown in Table 6 without objection by DFWP and DHES.

Table 6. Revised Instream Flow Reservation Proposed for Yellowstone River at Billings. (May 1 - September 30)

Month	Flow Cfs	Ac-ft		Approx. Percentile
May (1-20)	5,124	203,199		90.0
May (21-31)	12,204	266,214		
Jun (1-7)	17,242	239,337		87.8
Jun (8-30)	19,042	868,487		
Jul (1-10)	10,277	203,786	84.3%	91.1
Jul (11-31)	4,000	153,720	97.5%	
Aug	3,500	215,156		83.0
Sep	3,415	203,185		65.0

THE TONGUE RIVER

The Tongue River, a north-flowing tributary to the Yellowstone River, is important to the lower Yellowstone basin. From the Montana-Wyoming border to its confluence with the Yellowstone at Miles City, the Tongue supplies the area's agricultural, domestic and recreational needs.

Abundant resident game fish populations are supported by the Tongue, with smallmouth bass being the dominant and most popular species for anglers. In addition, the lower 20 miles of the Tongue provides spawning and nursery areas for several important species of fish from the mainstem Yellowstone. These include: shovelnose sturgeon, sauger and channel catfish.

Maintenance of the resident fish populations and suitable spawning areas for migratory species is dependent on adequate flows in the Tongue. The Department requested instream flows at the mouth of the Tongue River amounting to 290,000 acre-feet per year. Recommended flows ranged from 190 cfs during late fall and winter to 600 cfs during the spring period. These flows were designed to maintain both the resident and migratory fish populations.

The flow reservation granted on the Tongue River totalled 54,289 af/yr, or an average of 75 cfs for each month. The original request was reduced to allow as much firm water as possible for the proposed new Tongue River Dam. While 75 cfs could be considered a good flow during the summer when the river has historically gone dry, 75 cfs cannot be considered an adequate flow at other times.

Recent developments concerning the new Tongue River Dam indicate the possibility of partially or completely funding the project by mining the coal beneath the reservoir. Admittedly, many problems yet remain to be solved with this approach. However, the possibility now exists of permitting a greater flow to remain instream in the Tongue River with the new Tongue Dam. We would like to explore this matter further in a cooperative fashion.

STATUS OF YELLOWSTONE STUDIES

During the course of the water reservation process on the Yellowstone and the various impact assessments associated with coal development in eastern Montana, a large number of articles, reports and publications were generated. A partial compilation of reports pertinent to the biology of the Yellowstone and its tributaries or to the Department's effort to reserve instream flows in the Yellowstone basin is presented in Appendix A.

A portion of the water law pertaining to Reservations of Water states that "The board shall, periodically but at least once every 10 years, review existing reservations to ensure that the objectives of the reservation are being met. Where the objectives of the reservation are not being met, the board may extend, revoke, or modify the reservation." In addition, recent legislation (HB842 - 1979) confirmed the ability of the Board to reallocate water originally reserved for instream purposes to other qualified reservants. To reallocate reserved water, the Board must determine that "all or part of the reservation is not required for its purpose and that the need for the reallocation has been shown by the applicant to outweigh the need shown by the original reservant."

To meet the instream responsibility during the reservation review period and possible reallocation, several studies are either ongoing or have been initiated to provide necessary data. In addition to the studies referred to above, several recently completed projects provide additional sources of data for various parts of the Yellowstone basin.

A recently completed report entitled "The Ecological Implications of Yellowstone River Flow Reservations" (Peterman 1979, Appendix B) describes the reservation process as it applies to the lower Yellowstone below the confluence with the Bighorn River. This project, originally funded by the Fish and Wildlife Service, is being continued under State funding and will provide additional information on the instream flow requirements of the lower Yellowstone.

Current information for the upper Yellowstone drainage (above Big Timber) is contained in Southwestern Montana Fisheries Investigations Project F-9-R-26, Job 1-c (Stevenson 1979, Appendix C). This is an ongoing project encompassing the upper Yellowstone and Shields river drainages.

A primary productivity study on the Yellowstone has been completed after several years of study. This study shows how reduced river discharge rates and/or increased nutrient loading from irrigation return flows will increase algal productivity of the river. In addition, the study will provide additional insight into how algal productivity can adversely affect the dissolved oxygen balance of the river. The final report is scheduled for completion in March 1980.

Also, the Tongue River - MONTCO study is nearing completion. A final report entitled "Vital Statistics of Fishes in the Ashland-Birney area of the Tongue River" will be completed by spring 1980. This study further investigates the fish populations and instream flow needs of the Ashland-Birney section of the Tongue River.

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APPENDIX A

SUMMARY OF YELLOWSTONE RIVER STUDIES

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APPENDIX B

APPENDIX B

THE ECOLOGICAL IMPLICATIONS OF YELLOWSTONE RIVER FLOW RESERVATIONS

Research Conducted by:

Montana Department of Fish and Game
Ecological Services Division

Sponsored by:

Western Energy and Land Use Team
Office of Biological Services
Fish and Wildlife Service
U.S. DEPARTMENT OF THE INTERIOR

Prepared by:

Larry G. Peterman

MAY 1979

This Report is available upon request.

APPENDIX C

APPENDIX C

MONTANA DEPARTMENT OF FISH AND GAME

FISHERIES DIVISION

JOB PROGRESS REPORT

STATE: Montana TITLE: Southwestern Montana Fisheries Investigations

PROJECT NO.: F-9-R-26 TITLE: Inventory and Survey of Waters of the

JOB NO.: I-c Project Area

PERIOD COVERED: July 1, 1977 through June 30, 1978

REPORT PERIOD: February 1, 1977 through January 31, 1978

ABSTRACT

Water temperature data collected from the Yellowstone River between 1967 and 1977 showed the highest average and maximum water temperatures were recorded during the "high flow period" of 1977 when the lowest flows for that period occurred.

Photo points monitored on the Yellowstone River illustrate the dominant discharge and how quantity of stream flow affects food producing area and living space for fish.

The flow regime of the Yellowstone River during the spawning and incubation periods of brown (Salmo trutta) and rainbow (Salmo gairdneri) trout are illustrated for the years 1968 through 1976.

Spring population estimates of trout in the Yellowstone River for 1970 through 1977 showed the maximum fluctuations in numbers of trout between years and within study sections was approximately 200 percent for both brown and rainbow trout.

Correlation between the numbers of brown trout 6.0 inches and larger per 1000 feet and the mean daily flow between the last recapture dates of the estimates suggests that a relationship exists between incremental changes in flow and changes in brown trout populations of the upper Yellowstone River.

Analysis of the growth of 469 tagged trout in the Yellowstone River revealed similar patterns of growth between species, study sections and years. Growth patterns also showed a marked progressive decrease of annual growth increment with increased length and a wide range of annual growth increment within inch groups.

One year following partial rehabilitation of Dailey Lake, the average size of yellow perch (Perca flavescens) collected increased 1.1 inches, rainbow trout 1.1 inches, and kokanee (Oncorhynchus nerka) 4.4 inches.

This Report is available upon request.